3. Since the start of this project and the first handout describing the work was published the need for this project has been stated: To improve the shallow water habitat around the Alligator Chain of Lakes.

RESPONSES TO LAW OFFICES OF WILLIAM E. GUY, JR.
55 East Ocean Boulevard
Stuart, Florida 34995-3386
Letter Dated: 28 October 1999

1. Some of the more lengthy letters commenting on the Draft Environmental Impact Statement (EIS) was reduced to cut down on the number of pages in the Final EIS. The decision of whether to reduce the size of the print and therefore the number of pages included in the Final EIS was based on the length of the letter rather than its content.

2. **(a & b)** . The Army Corps of Engineers (Corps) is responsible for the content and conclusions of the EIS, not the South Florida Water Management District (SFWMD). However, during preparation of National Environmental Policy Act (NEPA) documents (in this case an EIS) the Corps requests and uses information provided by other agencies including the SFWMD to carry out the evaluation and documentation. The Corps also cites where information and data has come from while preparing the NEPA document. This procedure ensures accuracy and full compliance with the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of the NEPA (40 CFR Parts 1500-1508) as well as other appropriate laws and regulations.

3. **(a)** This comment has been addressed in previous responses (see comments 3, 4, 5 and 6 of OFFA 12 October 1999 letter to Mr. Jim Duck; see comment 5 of Mr. William Guy 25 October 1999 letter to Mr. Duck). **(b)** A supplemental EIS is not required to confirm the accuracy, reliability, and scientific integrity of the SFWMD's MIKE-SHE model and model interpretation. During preparation of this EIS, the Corps has reviewed the MIKE-SHE model and model results to ensure that both are sound and accurate.

4. **(a)** All appropriate permits have been applied for and issued. The appropriate permits required by the applicant have been issued by the Corps and Florida Department of Environmental Protection (FDEP). The SFWMD, which issues Consumptive Use Permits, has determined that this permit is not required for the proposed drawdown and in-lake work. **(b)** The SFWMD, which has some permitting authority in this area, has indicated that the "test drawdown" conducted in April 1998 was appropriately authorized. During the Final EIS comment period, the FDEP and the Florida State Clearinghouse did not raise any lack of state permitting issues with regard to the test drawdown. **(c-d)** Wetlands undergo natural wet and dry cycles. When lakes are held at stable levels for extended periods of time, adjacent wetlands and their associated wildlife are impacted. The catastrophic fires that occurred in Florida during the summer and fall of 1998 are evidence of long-term impacts that can occur as a consequence of protecting areas from natural events including burn

events. Although fires are not part of the proposed action and the Big Bend Swamp is not expected to be "dried up" as a result of the drawdown, wetlands adjacent to Alligator Lake may also benefit. This comment is placing inappropriate emphasis on the effect of the drawdown on wetlands: the drawdown is not expected to result in unnatural drying of wetlands, particularly not in the Big Bend Swamp area. **(e)** As stated in response number 2b above, the proposed project is in accordance with CEQ Regulations for Implementing NEPA (40 CFR Parts 1500-1508). **(f)** The U.S. Fish and Wildlife Service (USFWS) provided comments in accordance with the Endangered Species Act (ESA) concerning threatened and endangered species. The conclusion of the USFWS is that the bald eagle nest located within 0.8 mile from the lake would not be adversely impacted by the proposed work. USFWS letter dated 24 June 1997 stating this is included in Appendix II of the Final EIS. The USFWS has completed their responsibilities under the ESA.

5. This project has received rigorous and thorough review by FDEP and the Corps during the permitting phase that proceeded the EIS phase of the project. The project is considered to be in the public interest. Furthermore, the Corps has received letters from individuals who gain access to the lake through public boat ramps. The lakes' fishery and the other wildlife, including wading, migratory and songbirds, are considered to be public resources that will receive clear and significant benefits from improving habitat within the lakes ecosystem.

RESPONSE TO OSCEOLA FISH FARMERS ASSOCIATION, INC.
3460 Hickory Tree Road
St. Cloud, Florida 34772
Letter Dated: 29 October 1999

1. The Army Corps of Engineers (Corps) has no knowledge of a particular model being specified in the permit application or for the Final Environmental Impact Statement (EIS). Instead, the Corps would evaluate any model being proposed based on its general acceptance and applicability. Since models with increased capability are continually under development, the Corps would in general consider the use of such models, particularly if they exhibited an increased capability.

2. The Corps and the South Florida Water Management District (SFWMD) have the responsibility of deciding which model will be used to evaluate the drawdown. The OFFA, INC does not have the authority or expertise to demand which model should or will be used. The SFWMD has provided to the Corps supporting documentation on the model and its results. The Corps is satisfied with the SFWMD responses. The EIS is following an orderly and thorough process in accordance with appropriate regulations and laws.

3. MODFLOW is a well-established groundwater model, however it possesses limitations that make it less appropriate than the MIKE-SHE for modeling groundwater-surface water interactions such as exist in the Big Bend Swamp area.

4. The purpose of an EIS is not to include all data. CEQ Regulation 40 CFR Part 1502.2 (a) states "Environmental impact statements shall be analytic rather than encyclopedic." Subparagraph (b) states "Environmental impact statements shall be no longer than absolutely necessary to comply with National Environmental Policy Act (NEPA) and with these regulations." Refer also to comment/response #2 of this letter which addresses input received from the SFWMD.

RESPONSES TO LAW OFFICES OF WILLIAM E. GUY, JR.
55 East Ocean Boulevard
Stuart, Florida 34995-3386
Letter Dated: 29 October 1999

1. The Army Corps of Engineers (Corps) is unaware of the details of this request and subsequent response timeline from South Florida Water Management District (SFWMD).

2. See response to Comment 9 of OFFA 12 October 1999 letter to Mr. Jim Duck.

3. This comment has been addressed in previous responses (see comments 3, 4, 5, 6 and 9 of OFFA 12 October 1999 letter to Mr. Jim Duck; see comment 2 of Mr. William Guy 29 October 1999 letter to Mr. Jim Vearil, Ms. Carolan and Ms. Manners).

4. A Supplemental Environmental Impact Statement (EIS) is not required to further review and document the SFWMD's work involving the model or model results. The EIS complies with all of 40 CFR Parts 1500-1508 and other appropriate laws and regulations.

5. The permits issued by the Florida Department of Environmental Protection and the Corps to accomplish work in wetlands have been issued prior to preparing this EIS. The impacts associated with carrying out the work were evaluated during the permit process during which it was determined to be in the federal interest to issue the permit and authorize the work. The Corps permit is included in Appendix IV of the FEIS. This EIS covers the environmental impacts of modifying the Corps' Chain of Lakes regulation schedule. It would not be appropriate for the Corps to recommend that the permits be withdrawn for the proposed drawdown while the EIS is under preparation.

RESPONSE TO OSCEOLA FISH FARMERS ASSOCIATION, INC.
3460 Hickory Tree Road
St. Cloud, Florida 34772
Letter Dated: 1 November 1999

1. South Florida Water Management District's (SFWMD) refusal to provide the MIKE SHE source code is dictated by provisions in their licensing agreement with Danish Hydraulic Institute (DHI).

2. This comment has been addressed in previous responses (see comments 3, 4, 5, 6 and 9 of OFFA 12 October 1999 letter to Mr. Jim Duck; see comment 4, 5 and 6 of Mr. William Guy 25 October 1999 letter to Mr. Jim Duck; see comment 2 of Mr. William Guy 29 October 1999 letter to Mr. Jim Vearil, Ms. Carolan and Ms. Manners).

3. The video shown to the Army Corps of Engineers (Corps) has minimal reference points. After the Corps compliance inspection on 10 December 1999, it was determined the video may have been filmed in areas which have already been demucked when the water levels were low due to a summer drought.

4. During the 10 December 1999 compliance inspection, a Corps representative visited the disposal site on the Perry property and found a large pile of lake spoils in the uplands. Due to the lack of a contractual agreement on one of the disposal sites, some of the muck materials were transported approximately 10 miles to the Perry property and disposed of in upland areas. The Corps Regulatory staff reviewed these areas and no wetlands fill areas were observed. The entire Perry site was not surveyed. Only those areas represented by Florida Fish and Wildlife Conservation Commission personnel as areas receiving mucks from the lake restoration were inspected.

5. The Corps received information from fish farmers regarding conditions at their farms at the time of the test drawdown. As stated in item 10 of the responses to comments from the Law Offices of William E. Guy, Jr., in the Final Environmental Impact Statement, the adverse effects the fish farmers stated they experienced in 1998-99 appear to be due to the extreme climatic conditions that occurred after the test, not the test drawdown.

RESPONSES TO LAW OFFICES
FISHBACK, DOMINICK, BENNETT,STEPTER,
ARDAMAN, AHLERS & BONUS
170 East Washington Street
Orlando, Florida 32801-2397
Letter Dated: 30 November 1999

1. In paragraph 3 of Appendix I of the Final Environmental Impact Statement indicated that the South Florida Water Management District (SFWMD) has been investigating the possibility of installing a temporary structure in the vicinity of Brick Lake Canal. If installed, the temporary structure would maintain water levels in Brick Lake higher than in the rest of the Alligator Chain during the Alligator Chain's drawdown. Paragraph 3 also indicated that the original plan for a temporary structure to maintain water levels in Brick Lake would have the temporary structure located in Brick Lake Canal, but that negotiations with landowners were unsuccessful. If a temporary structure is installed to maintain water levels in Brick Lake, it will not be located in the original planned location in Brick Lake Canal. As of mid-August 1999, The SFWMD was considering installation of a water control structure in Alligator Lake just outside of Brick Lake Canal. The Army Corps of Engineers will not require, as a condition for the proposed drawdown regulation schedules to be approved, that a temporary structure be installed to maintain water levels in Brick Lake during the drawdown. As of late January 2000, the SFWMD is still considering installation of a temporary structure in Alligator Lake at the entrance to Brick Lake Canal to mitigate effects of the project. Because it is not certain that this structure will be erected, for purpose of evaluating the impacts of the project, the Corps will assume that a temporary structure will *not* be installed to maintain water levels in Brick Lake during the drawdown.

RESPONSES TO SUNSET TROPICALS
3981 Doe Drive
St. Cloud, Florida 34772
Letter Dated: 8 December 1999

1. Concur.

2. The Alligator Lake Chain and Lake Gentry Extreme Drawdown project does not include modification the regulation schedule for West Lake Tohopekaliga. The hydrologic modeling performed for the Final EIS shows Sunset Tropicals to be outside the cone of influence as exerted by the extreme drawdown of the Alligator Lake Chain and Lake Gentry.

3. See response to comment 2, above.

RESPONSES TO CASTELLI FARMS
7580 E. Irlo Bronson Memorial Highway
St. Cloud, Florida 34771
Letter Dated: 8 December 1999

1. The existence of aerial photography showing a continuous extension of wetlands from Brick Lake and Lake Gentry over to near Castelli Farms does not define the extent of the drawdown cone of influence. The extent of the cone of influence is determined primarily by elevation differences, distance from the lake, soil type, surface roughness, rainfall recharge, and time duration. South Florida Water Management District's topographic data shows Big Bend Swamp at land elevations varying from about elevation 63 to 64 feet at Lakes Brick and Gentry and gradually rising to about elevation 69 to 70 feet in the eastern perimeter near the Castelli and Exotic fish farms. If the Big Bend Swamp tends to stay wet, as Mr. Castelli has indicated, this would also imply that the water elevations in Big Bend Swamp gradually rise from west to east. Although Big Bend Swamp exhibits a sloping water surface, the water tends to remain in the swamp because of the large hydraulic resistance to flow from wetlands vegetation and the soil moisture retention capacity of the swamp's organic laden soils. Thus, the existence of a typically wet Big Bend Swamp, based on the supplied topographic data, is convincing evidence that Big Bend Swamp water levels tend to be more influenced by rainfall and evapotranspiration rather than downstream lake levels. The idea that Big Bend Swamp is essentially a 'big bowl of water' (i.e., one continuous, uninterrupted surface water body in which water level changes on one side quickly affect water levels on the other side) could only be tenable if the water levels in the lakes and Big Bend Swamp were nearly equal throughout or if swamp ground elevations (including slough inverts) were consistently below lake levels near the eastern perimeter of the swamp.

2. The Environmental Impact Statement evaluates impacts on wetlands, fish and wildlife, and all pertinent environmental resources.

RESPONSES TO BLACKWATER FISHERY INC.
3460 Hickory Tree Road
St. Cloud, Florida 34772
Letter Dated: 8 December 1999

1. South Florida Water Management District's (SFWMD) modeling shows that there will be groundwater impacts to the Blackwater Fisheries under the typical and drought condition rainfall scenarios primarily because of the influence of the Blackwater Ditch described by Ms. Walther. In order to mitigate for these impacts, SFWMD proposed the construction of a weir in the Blackwater Ditch that would maintain water stages in the ditch at a higher water level than Lake Alligator. The modeling shows that with a weir installed, Blackwater Fisheries would not be impacted by an extreme drawdown under the same rainfall conditions experienced between November 1997 to November 1998. Without a weir and under severe drought conditions, the drawdown is projected to lower the water table an average of 0.1 feet during the first year of the drought and by an average of 0.4 feet the second year (assumes rainfall pattern experienced during 1980-1981). It should be noted that the drainage ditch adjacent to Ms. Walther's property is already a major controlling influence on fishpond levels. Without a drawdown of Lake Alligator, water levels in the ponds can be expected to fall to extremely low levels (or completely dry) during severe drought conditions. Although the drawdown is projected to lower groundwater levels at Blackwater Fisheries as described above, modeling indicates these impacts could be significantly reduced if a weir is installed within Blackwater Ditch a sufficient distance downstream from the fish ponds. The SFWMD has indicated that its discussions with fish farmers concerning installation of the proposed weir in the Blackwater ditch and other measures to reduce or offset potential impacts from the drawdown did not result in an agreement between SFWMD and the fish farmers. Therefore, for the purpose of evaluating the impacts of the drawdown project, the Army Corps of Engineers will assume that these actions, including installation of the proposed weir in the Blackwater ditch, will not be performed. However, the SFWMD and Florida Fish and Wildlife Conservation Commission have indicated that as of early January 2000, Osceola County is considering installation of the proposed weir in the Blackwater ditch.

2. Refer to previous response.

RESPONSES TO DEPARTMENT OF COMMUNITY AFFAIRS
2555 Shumard Oak Boulevard
Tallahassee, Florida 32399-2100
Letter Dated: 9 December 1999

1. The Army Corps of Engineers has been working closely with the Florida Fish and Wildlife Conservation Commission (FWC) on this project.

2. Potential for the drawdown to contribute to phosphorus loading in Lake Okeechobee and Lake Kissimmee was considered. It is highly unlikely that lowering water levels and removing muck and other detritus from de-watered areas down to clean sand in Alligator Lake will impact phosphorus levels in either of these two lakes. The southern outlet structure for Alligator Lake (S-60) is estimated to be roughly 21 miles upstream from Lake Kissimmee and roughly 93 miles upstream from Lake Okeechobee. Also, Alligator Lake is separated from Kissimmee Lake by several lakes in the chain: Lake Hatcheneha, Cypress Lake, and Lake Gentry.

3. Concur

4. The project sponsor, FWC, will insure that the work is coordinated with the State Historic Preservation Officer and that prior to the drawdown any sites are located, marked, and protected.

RESPONSES TO CASTELLI FARMS
7580 E. Irlo Bronson Memorial Highway
St. Cloud, Florida 34771
Letter Dated: 9 December 1999

1. The Army Corps of Engineers (Corps) is very familiar with wetland maps and other data produced by National Wetlands Inventory (NWI) of the U.S. Fish and Wildlife Service as a result of the Emergency Wetlands Resources Act of 1986. As stated in the information enclosed with Mr. Castelli's letter, Congressional mandates required the NWI to provide status and trends reports concerning the nation's wetlands to Congress at 10 year intervals. These wetland maps and data are available over the internet or from the U.S. Geological Service not from the Corps. As stated in Section 2 (b) of the Act: It is the purpose of this Act to promote, in concert with other Federal and State statutes and programs, the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions. The proposed drawdown which would benefit the lakes (and possibly to a more limited extent adjacent wetlands) is certainly not in conflict with the Act as suggested by Mr. Castelli.

2. The existence of aerial photography and/or maps showing a continuous extension of wetlands from Brick Lake and Lake Gentry over to near Castelli Farms does not define the extent of the drawdown cone of influence. See response to comment 1 of the letter dated 8 December 1999 from Mr. David Castelli to Mr. James Duck and others.

3. The Environmental Impact Statement (EIS) is not "a fairytale with no substance in fact" or "false." The EIS, using detailed hydrologic and biological information, demonstrates that the lakes, and possibly to a much less extent, adjacent wetlands, would benefit from the proposed drawdown.

4. See response to Comment #2, above.

RESPONSE TO OSCEOLA FISH FARMERS ASSOCIATION, INC.
3460 Hickory Tree Road
St. Cloud, Florida 34772
Letter Dated: 9 December 1999

1. The National Wetland Inventory (NWI) maps were not included in the Environmental Impact Statement because including them would not have added to the technical merit or evaluation of the proposed drawdown.

2. It is not clear how the action of the fish farmers would protect wetlands. The proposed drawdown would have no detrimental impact on wetlands.

3. It is not clear how "deleting" (not including) the NWI maps would show a conspiracy by all the agencies to hold the truth from the public. The focus of the drawdown is on Alligator Lake and Lake Gentry not on Big Bend Swamp.

4. These accusations do not make sense. These maps are available to the public.

RESPONSES TO LAW OFFICES OF WILLIAM E. GUY, JR.
55 East Ocean Boulevard
Stuart, Florida 34995-3386
Letter Dated: 9 December 1999

1. This comment has been addressed in previous responses (see Comments 3, 4, 5 and 6 of OFFA 12 October 1999 letter to Mr. Jim Duck; see Comments 2 and 3 of OFFA 21 October 1999 letter to COL Joe Miller).

2. This comment has been addressed in previous responses (see Comments 4, 5 and 6 of OFFA 12 October 1999 letter to Mr. Jim Duck; see Comment 4 of Mr. William Guy 25 October 1999 letter to Mr. Jim Duck; see Comment 1 of OFFA 29 October 1999 letter to Mr. Jim Duck).

3. This comment has been addressed in previous responses (see Comment 2 of Mr. William Guy 29 October 1999 letter to Mr. Jim Vearil, Ms. Carolan and Ms. Manners).

4. This comment has been addressed in previous responses (see Comment 5 of OFFA 12 October 1999 letter to Mr. Jim Duck; see Comments 4 and 5 of Mr. William Guy 25 October 1999 letter to Mr. Jim Duck).

5. The Fish Farmers have discovered no substantial new information, which invalidates the MIKE SHE model results.

6. This comment has been addressed in previous responses (see Comment 6 and 7 of OFFA 21 October 1999 letter to COL Joe Miller; see Comment 1 of Mr. David Castelli 8 December 1999 letter to Mr. James Duck and others).

7. Comments a-k and m have been addressed in previous responses (see the response to Comment 10 from William E. Guy, Jr., in the Final EIS; see Comments 3, 4, 5, 6 and 9 of OFFA 12 October 1999 letter to Mr. Jim Duck; see Comments 2, 3, 6 and 7 of OFFA 21 October 1999 letter to COL Joe Miller; see Comments 4, 5, 6 and 7 of Mr. William Guy 25 October 1999 letter to Mr. Jim Duck; see Comments 1 and 3 of OFFA 29 October 1999 letter to Mr. Jim Duck; see Comments 2 and 3 of Mr. William Guy 29 October 1999 letter to Mr. Jim Vearil, Ms. Carolan and Ms. Manners; see Comment 1 of Mr. David Castelli 8 December 1999 letter to Mr. James Duck and others). The response to comment L is the Army Corps of Engineers (Corps) does not have data from wells indicating if the wetlands are continuously wet, however, National Wetlands Classification information lists a large portion of Big Bend Swamp as semi-permanently flooded. This implies portions of Big Bend Swamp are inundated a large percentage of the time. South Florida Water

Management District's (SFWMD) MIKE-SHE model includes topography for Big Bend Swamp based on a 200 x 200 meter grid that allows surface water to flow all the way down to the ground surface. This provision allows the model to assess the effects of dropping swamp water elevations on the adjacent fish farms. In addition, Russell Ditch, extending eastward and then southward from Lake Gentry into Big Bend Swamp, is represented as an overland flow component in the model to simulate its drainage effect on the adjacent wetlands. Lowering the lake water levels would only effect water levels in the adjacent wetlands to the extents defined by the cone of influence. Moreover, since the lakes would not be lowered below water levels that occurred naturally prior to lake regulation, likewise, water stages in the wetlands would tend to not fall below levels previously experienced. Whether or not the wetlands near the lake actually dried up more than historically experienced would be largely due to the amount of rainfall received during the drawdown.

8. Based on our review, we do not find that major erroneous assumptions have been incorporated into the MIKE SHE model. The MIKE SHE is a surface-groundwater model and was specifically used for the drawdown project since a strictly groundwater model may have underestimated impacts to the fish farmers. The wetlands and Big Bend Swamp adjacent to Lakes Gentry and Brick have been modeled with the available topographic information and additionally; Russell Ditch has been simulated as an overland flow component to represent its drainage effect on Big Bend Swamp. The steady-state simulations performed by both SFWMD and Dr. Voorhees are groundwater only models and do not consider surface water independently. Therefore, results from these simulations would tend to overpond water at locations in the swamp that are far removed from the lakes and underpond water closer to the lake. Overponding in the model is due to the lack of a surface drainage component that would move surface water slowly towards the lakes. Underponding can be partly explained by the low lake level (relative to the surrounding ground elevations) influencing the adjacent groundwater beneath the ground surface so that the land surface remains dry. Also, the accuracy of the wetland classification maps is often suspect since they are developed from aerial photography and are seldom groundtruthed. Thus, there are a number of legitimate factors that could explain the discrepancy between model-simulated ponded areas and map depicted wetlands.

9. There are no new wetland issues that are not already covered in the existing Final Environmental Impact Statement (EIS). A supplemental EIS is not necessary or appropriate.

RESPONSES TO CASTELLI FARMS
7580 E. Irlo Bronson Memorial Highway
St. Cloud, Florida 34771
Letter Dated: 9 December 1999

1. The drawdown is most certainly not dis-allowed by the ERWA of 1986 and National Wetlands Inventory maps. The purpose of the drawdown is to benefit Alligator Lake public resource. So in a way the two are compatible, as they are both intended to benefit public environmental resources.

2. This comment has been addressed in previous response (see Comment 2 of OFFA 21 October 1999 letter to COL Joe Miller).

3. The proposed drawdown would not result in water levels being any lower than would have occurred naturally before water levels were held at artificially high levels.

4. This comment has been addressed in previous response (see Comment 2 of OFFA 21 October 1999 letter to COL Joe Miller).

ATTACHMENT I

ATTACHMENT 1

FLORIDA GAME AND FRESH WATER FISH COMMISSION

Eustis Fisheries Research Lab
P. O. Box 1903
Eustis, FL 32727-1903
Phone: 352-357-6631
Fax: 352-357-6635

September 23, 1998

MEMORANDUM

TO: Mike Hulon

FROM: Homer Royals

SUBJECT: Metals Results from Kissimmee Chain Sediments

Enclosed are the results of the August 1998 sediments collection from six Kissimmee chain lakes. These same lakes were analyzed in 1997 and the results are similar. The samples where organic matter was high had higher metals (Cu, Zn, Cd and Pb) concentrations. All are within normal ranges for metals in Florida sediments.

HER:sct

November 20, 1997

Kissimmee Chain and Lake Panasofkee Sediment Trace Metals

LABID	Sample	%Org	%Inorg	Sample wt (g)	Digest Cu (µg/l)	Cu CONC DRY WT (µg/kg)	Digest Zinc (µg/g)	Zn CONC DRY WT (µg/kg)	Digest Cd (µg/g)	Cd CONC DRY WT (µg/kg)	Digest Pb (µg/g)	Pb CONC DRY WT (µg/kg)	TP Dry Wt mg/kg	TN Dry Wt mg/kg
1	ALL#1	1.6	98.4	2.0440	17.9	43019	198.9	47876	ND	ND	98.4	23685	741	15620
2	ALL#2	8.8	91.2	2.1580	ND	ND	170.7	36070	ND	ND	35.4	7480	547	9180
3	ALL#3	0.5	99.5	2.1340	219.0	5105.6	446	10397.6	ND	ND	357.1	8325.1	787	29900
4	COON	3.6	96.4	2.2640	58.1	1236.9	417.8	8894.9	ND	ND	198.9	4234.5	114	2660
5	CENTER#1	9.0	91.0	0.5000	51.4	4677.4	191.8	17453.8	ND	ND	24.2	2202.2	100	1680
5DUP	CENTER#1	9.0	91.0	0.5000	51.4	4677.4	202.4	18418.4	ND	ND	24.9	2265.9	[illegible]	[illegible]
5SPIKE	CENTER#1	9.0	91.0	0.5000	165.4	[illegible]	280.1	[illegible]	107.9	[illegible]	144.9	[illegible]	[illegible]	[illegible]
5SPIKE	CENTER#1	9.0	91.0	0.5000	152.0	[illegible]	325.9	[illegible]	113.6	[illegible]	147.9	[illegible]	[illegible]	[illegible]
6	CENTER#2	1.1	98.9	2.0620	11.2	2681.6	184.8	44318	ND	ND	68.4	16403.5	307	2780
7	GENTRY#1	2.4	97.6	3.1020	11.2	1761.2	223.6	35176	ND	ND	119.4	18784	407	7040
8	GENTRY#2	10.6	89.4	4.0020	17.9	1999	220.1	24581.4	ND	ND	96.9	10823	483	26500
9	LIZZIE#1	6.3	93.7	0.5610	198.9	16610.5	347.2	28995.2	ND	ND	203.4	16986.3	423	17420
10	LIZZIE#2	1.3	98.7	2.2650	84.9	1849.8	234.2	5102.8	ND	ND	214.7	4677.9	80	18800
11	TROUT#1	3.6	96.4	2.4700	ND	ND	174.2	3399.4	ND	ND	24.9	485.9	304	9960
12	TROUT#2	16.8	83.2	2.0000	44.7	929.8	241.3	5019.0	ND	ND	200.4	4168.3	451	35100
P1	PAN#1	10.3	89.7	1.0050	359.8	16056.7	495.4	22108.1	136.1	6073.7	50.4	2249.2	1222	33300
P1DUP	PAN#1	10.3	89.7	1.0210	366.5	16099.4	477.8	20988.6	144.5	6347.5	47.4	2082.2	[illegible]	[illegible]
P2	PAN#2	9.3	90.7	1.0040	326.3	14738.8	587.2	26523.4	147.3	6653.4	177.9	8035.6	1501	30900
P2DUP	PAN#2	9.3	90.7	1.0820	359.8	15080.3	597.8	25055.7	158.6	6647.4	155.4	6513.3	[illegible]	[illegible]

Mean for Duplicates

#5	CENTER#1	4677.4	17936.1	ND	2234.1
#P1	PAN#1	16078.1	21548.4	6210.6	2165.7
#P2	PAN#2	14909.5	25789.5	6650.4	727.45

QA Results from Sample #5

Duplicate %RSD=	0.0	3.8	0.0	2.0
Spike % Recover	114.0	83.0	107.9	120.4
	100.6	128.8	113.6	123.4

October 22, 1998
Kissimmee Chain Sediment Trace Metals
File: KISSSEDS2.WB3

LABID	Sample	%Org	%Inorg	Sample wt (g)	Digest Cu (µg/l)	Cu CONC DRY WT (µg/kg)	Digest Zinc (µg/g)	Zn CONC DRY WT (µg/kg)	Digest Cd (µg/g)	Cd CONC DRY WT (µg/kg)	Digest Pb (µg/g)	Pb CONC DRY WT (µg/kg)
1	Gentry 1	0.8	99.2	5.0000	25.2	250.0	281.6	2793.5	ND	ND	98.2	974.1
2	Gentry 2	0.8	99.2	5.0360	19.2	189.1	297.7	2932.1	ND	ND	136	1339.5
3	Alligator 1	1.8	98.2	4.6460	31.2	329.7	249.5	2636.8	ND	ND	115.5	1220.6
4	Alligator 2	1.0	99.0	5.0000	7.1	70.4	217.4	2152.3	ND	ND	74.4	736.6
4 DUP	Alligator 2	1.0	99.0	5.0000	1.1	10.6	185.3	1834.5	ND	0.0	84.2	833.6
4 SPIKE	Alligator 2	1.0	99.0	5.0000	170.0	1683.0	351.8	3482.8	149.1	1476.1	241.9	2394.8
5	Alligator 3	6.9	93.1	4.0000	188.1	2189.0	431.4	5020.4	8.0	92.5	433.2	5041.4
5 DUP	Alligator 3	6.9	93.1	4.0000	242.3	2819.8	559.8	6514.7	13.9	161.8	439.7	5117.0
5 SPIKE	Alligator 3	6.9	93.1	4.0000	489.6	5697.7	789.9	9192.5	183.0	2129.7	679.6	7908.8
6	Lizzie	0.7	99.3	5.1070	19.2	186.7	260.2	2529.7	ND	ND	93.9	912.9
7	Trout	4.3	95.7	4.3200	224.2	2483.3	570.5	6319.1	11.9	132.1	665.5	7371.3
8	Coon	0.7	99.3	5.0270	7.1	70.2	238.8	2358.5	ND	0.0	88.5	874.1
9	Center 1	0.0	100.0	4.8830	1.1	11.0	217.4	2226.1	ND	0.0	20.4	208.9
10	Center 2	0.4	99.6	4.5020	13.1	144.9	206.7	2286.5	ND	0.0	57.1	631.6

Mean for Duplicates

#4	Alligator #2	4.1	40.5	201.4	1993.4	0.0	0.0	79.3	785.1
#7	Alligator #3	215.2	2504.4	495.6	5767.5	10.9	127.1	436.5	5079.2

QA Results from Sample #4

Duplicate %RSD=	104.4	11.3	0.0	8.7
Spike % Recovery=	83.0	75.2	74.6	81.3

QA Results from Sample #7

Duplicate %RSD=	17.8	18.3	38.5	1.1
Spike % Recovery=	137.2	147.2	86.0	121.6

Conversion from Concentration (µg/L) in digestate to Concentration in Dry Sed. (µg/Kg) for Gentry #1 Copper:

$$\frac{25.2\mu g\ Cu}{L} \times \frac{50\ ml}{5.000g} \times \frac{1L}{1000\ ml} \times \frac{99.2g\ Inorg}{100\ g\ Samp} \times \frac{1000g}{1\ kg} = \frac{250\ \mu g\ Cu}{kg\ Sed.}\ \text{Dry Wt.}$$

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ENCO Laboratories

CASE NARRATIVE

DHRS Certification No. E83182

Date: December 9, 1999

Client: Florida Fish & Wildlife Conservation Commission

Project Reference: "Alligator Chain"

PO #: S 7750 503128

Lab ID:OR8556

Overview

All samples submitted were analyzed by Environmental Conservation Laboratories, Inc. in accordance with the methods referenced in the laboratory report. There were no particular difficulties encountered during the handling and analyses of the samples by Environmental Conservation Laboratories, Inc.

The laboratory analyzed the samples submitted by EPA Method 8081 for organochlorine pesticides. All associated quality assurance and data validation objectives were met for the results reported. There were no target analytes / compounds subject to determination by EPA Method 8081 found in the samples submitted.

Should there be any questions regarding this package, please feel free to contact the undersigned for additional information.

Released By:

Environmental Conservation Laboratories, Inc.

David J. Vesey
Project Manager

ATTACHMENT II

ATTACHMENT 2

STATE OF FLORIDA

GAME AND FRESH WATER FISH COMMISSION

1991- 1996

COMPLETION REPORT

FOR

KISSIMMEE CHAIN OF LAKES STUDIES

STUDY III. EAST LAKE TOHOPEKALIGA/ALLIGATOR LAKE CHAIN INVESTIGATIONS

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ACKNOWLEDGMENTS

We would like to thank all the fish camp owners, sports writers, concerned fishermen and many others, without whose support our enhancement programs would never be implemented. Our sincere appreciation is extended to the South Florida Water Management District, Florida Department of Environmental Protection, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, Osceola County and the City of St. Cloud for their efforts and cooperation. We gratefully acknowledge Laboratory Technician Don Arwood for his contribution to this program. Special thanks goes to our secretary Anna Jasent. The hard work of Don and Anna have kept the project running smoothly.

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STATE: Florida

PROJECT NO.: 6300
RCC: 2035

PROJECT TITLE: Kissimmee Chain of Lakes Studies

PROJECT COVERED: 1 July 1991 through 30 June 1996

PROJECT OBJECTIVE: Implement water level manipulation to enhance sport fishing and improve habitat conditions.

STUDY NO. AND TITLE: III. East Lake Tohopekaliga/Alligator Lake Chain Investigations

STUDY OBJECTIVE: To measure changes in water quality and fish populations in East Lake Tohopekaliga. Assess the fishery habitat and restoration/enhancement projects implemented on lakes Center, Coon and East Lake Tohopekaliga.

ABSTRACT

Water quality on East Lake Tohopekaliga and its associated watershed continued to be characterized by low nutrient and pH values. Total nitrogen, ortho-phosphorus, total phosphorus, and chlorophyll a. generally remained unchanged since 1986. Comparisons of spring creel surveys before and after the 1989-90 Habitat Enhancement Project showed slightly increased total catch success (1989:0.17/h; 1994:0.22/h) for largemouth bass (*Micropterus salmoides*), but decreased harvest and effort. Harvest and success rates increased for black crappie (*Pomoxis nigromaculatus*) and panfish but were still less than historical values for lakes' Tohopekaliga and Kissimmee. Sportfish abundance in lakewide electrofishing transects peaked in 1991-92 and returned to pre-drawdown levels by 1993. Largemouth bass and bluegill (*Lepomis macrochirus*) peaks were associated with strong reproduction in 1990-91. Electrofishing on 1990 muck removal sites indicated utilization of sportfish through 1996. Young-of-year largemouth bass in shallow water fish samples averaged 2,144 fish/ha in muck removal sites compared with 374/ha in unenhanced areas (1991-1994). Age and growth analysis in 1994 revealed 42% of largemouth bass sampled were composed of the 1991 year-class. Aquatic plant analysis of muck removal sites indicated lower density and more favorable plant communities following the 1990-91 Habitat Enhancement Project. Semi-annual macroinvertebrate studies showed both muck removal and unenhanced areas were dominated by oligochaetes (aquatic worms) and chironomids (midges). Snail Kite (*Rostramus sociabilis*) observations noted 74% of the birds were sighted on, or adjacent to, muck removal sites. Bluegill and Florida gar (*Lepisosteus platyrhincus*) dominated catch-per-unit-effort estimates for lakes Coon and Center during 1992 to 1995. Only three largemouth bass

$\geq$ 356 mm were sampled from each lake during the study and forage species were limited. The aquatic plant harvesting project on the Alligator Chain of Lakes removed 19.7 ha of floating tussocks. Giant bulrush *(Scirpus californicus)*, maidencane *(Panicum hemitomon)* and knotgrass *(Paspalidium geminatum)* recolonized the enhanced areas.

INTRODUCTION

East Lake Tohopekaliga is a 5,484 ha lake located in northeast Osceola County. Lake levels fluctuate between 16.8 and 17.7 m mean sea level (msl) as determined by a U.S. Army Corps of Engineers (USACOE) flood control schedule. The Alligator Chain, also located in northeast Osceola County, is composed of lakes Trout (111 ha), Center (166 ha), Coon (60 ha), Lizzie (321 ha), Alligator (1,378 ha), and Brick (249 ha). Water levels on the Alligator Chain are all managed by the USACOE between 18.9 m msl - 19.5 m msl. For more detail on both these systems see South Florida Water Management District (SFWMD) 1981, Moyer et al. 1985a, Moyer et al. 1985b, and Moyer et al. 1991.

Both East Lake Tohopekaliga and the Alligator Chain (Figure 1) are characterized by deep, clear water that is low in pH, alkalinity and primary productivity (Moyer et al. 1991, Bachmann et al. 1993). Fish populations have generally been dominated by sub-harvestable sportfish and low forage indices (Wegener et al. 1969, Moyer et al. 1985a, Moyer et al. 1985b, Moyer et al. 1991). Reduction of basin size and deterioration of littoral zone habitat due to the flood control practices have been cited as major factors negatively impacting these fisheries (Moyer et al. 1985a, Moyer et al. 1985b, Moyer et al. 1991).

In 1989-90, The Florida Game and Fresh Water Fish Commission (FGFWFC) conducted a habitat enhancement project on East Lake Tohopekaliga that incorporated an extreme drawdown, muck removal, burning and discing. Water levels were lowered 0.61 m below low pool stage from late February to April 1990 (Moyer et al. 1991). During this time 325,207 cubic meters of muck were removed from 22.4 km of shoreline. An additional 62 ha were burned and disced along 2.7 km of lakeshore.

The primary focus of this report is to examine the responses of invertebrates, aquatic plants, fish populations and Snail Kites to the 1989-90 Habitat Enhancement Project. The secondary purpose

is to detail harvesting work on the Alligator Chain and electrofishing studies conducted on lakes Coon and Center.

MATERIALS AND METHODS

EAST LAKE TOHOPEKALIGA

Water Quality

Quarterly water samples were taken from locations in Boggy Creek and East Lake Tohopekaliga from January 1991 through April 1996 (Figure 2). Six sites were sampled through 1995; sites 1 and 2 were dropped in 1996. Data recorded on-site included temperature, depth, Ph (meter), specific conductivity (meter), water clarity (Secchi disc) and alkalinity. Samples were transported to the Eustis Research Laboratory and analyzed for sulphate, calcium, magnesium., sodium, potassium, turbidity, nitrogen and phosphorus. In addition to the above parameters, chlorophyll a and phaeopigments were determined for lake stations. Measurements of ortho-phosphorus and total phosphorus (both expressed as elemental phosphorus), total nitrogen and chlorophyll a are the only parameters discussed in this report.

Creel Survey

A roving creel survey utilizing non-uniform probability was implemented from 11 February to 5 May 1994. The lake was divided into two areas for sampling purposes (Figure 3). Either area A or area B was randomly selected to provide a starting point for the creel clerk. The lake was sampled two weekend and three weekdays, which were chosen at random, during a single two-week period. Instantaneous counts of fishermen were randomly selected to occur during the first or second hour in each area. The remaining time was spent conducting fishermen interviews. Estimates of largemouth bass caught and released by bass fishermen were also obtained. Data reflects two size ranges for bass released, those under 356 mm in total length (TL) and those 356 mm and larger TL. Pre-tournament, tournament, and non-tournament fishermen were identified in both 1989 and 1994 creels using methods and criteria described in Hulon et al. (1992). Creel data were analyzed using the Division of Fisheries' computer programs.

the western shoreline (Figure 4). Depths on the transects were as follows: January 1991 (<0.4 m), July 1991 (0.87 m - 1.1 m), January 1992 (1.2 m - 1.8 m), and July 1992 (0.88 m - 0.94 m). Four replicates were collected at five sampling points located 10 m apart along each transect by both sweep net and corer. A 190 mm X 440 mm sweep net with 1 mm nylon mesh was used to make two and a half 1.5 m sweeps at the surface of the vegetated water column, thus representing 0.375 m^3 of vegetated water column per sample. Relative abundance (percent cover) was subjectively determined for each macrophyte species. Sediments were sampled using a corer with a diameter of 86 mm, representing 58 cm (squared) per sample. Sediments were rinsed in a US Standard Sieve No. 30 (0.5 mm) mesh-bottomed bucket, placed in jars and preserved in 10% formalin with rose bengal.

In the laboratory, macroinvertebrates were sorted from vegetation and sediments and stored in 70% ethanol for identification. A stereo-microscope (40X) was used for enumeration and identification to the lowest possible taxon.

Snail Kites

An airboat was used to count Snail Kites one day each month from January 1990 to June 1996. When birds were observed, notations were made regarding color, courting, nesting, feeding activities, and utilization of muck removal sites. When nesting began, weekly surveys were made to determine numbers of eggs, nestlings and fledglings, and success or failure of nests. Fledglings were banded with standard United States Fish and Wildlife Service (USFWS) bird bands and green and yellow plastic strips. Data were collected in 1989 by Jim Rodgers (FGFWFC: Wildlife Division).

ALLIGATOR LAKE CHAIN

Fish Populations

Three fixed locations within the littoral zone of lakes' Coon and Center were sampled by electrofishing once annually for 15 minutes pedal time/site (Figure 5). Coon Lake was surveyed during spring from 1992-95; Lake Center during spring from 1993-95. Equipment and field procedures are the same as that outlined above for lakewide sites in East Lake Tohopekaliga. Harvestable largemouth bass and bluegill are as previously defined.

Habitat Improvement

Mechanical harvesting of floating tussocks began January 1992 and was completed March 1995 (Figure 5). All harvesting operations took place between January and March of each year, while lakes were at high-pool stage (19.5 m msl) with the exception of 1994, when no work was accomplished. Equipment consisted of two 3.1 m harvesters, one 2.4 m harvester, an off-loading conveyor and dump trucks.

RESULTS AND DISCUSSION

EAST LAKE TOHOPEKALIGA

Water Quality

Nutrient and primary productivity parameters continued to be among the lowest recorded on the Kissimmee Chain of Lakes (Table 1). Total nitrogen, ortho-phosphorus, total phosphorus and chlorophyll a generally remained unchanged since 1986. However, some notable exceptions did occur within the watershed.

Total phosphorus in Boggy Creek upstream from Boggy Creek Swamp was exceptionally high during the later part of 1993. The pulse may have been due to organics deposited by a solid hyacinth mat covering the sample site. There is also the possibility that it was due to a nonpoint source upstream. In any event a 1994 herbicide treatment reduced hyacinth coverage to satisfactory maintenance levels.

Road work conducted at Boggy Creek Road bridge in 1994 elevated total phosphorus levels both at the bridge and where the creek enters the lake (station B-2 and B-3). Following cessation of road work, levels returned to values noted before the construction activity.

Chlorophyll a in the middle of East Lake Tohopekaliga (station B-4) pulsed to 68.6 mg/m^3 in April 1995 following a Sonar treatment of hydrilla. Values returned to below 10 mg/m^3 by April 1996. Appendix 1 lists all water quality data collected on the Boggy Creek drainage from 1991 through April 1996.

During the study period, 53 sightings of Snail Kites banded on East Lake Tohopekaliga were observed on 10 different water bodies throughout Florida (Table 22).

Snail Kites predominantly utilized 1990 enhanced sites. Of the birds observed, 74% were sighted on, or adjacent to, enhanced sites (Figure 7). This phenomenon was likely caused by the fact that enhancement activities (muck removal) cleared feeding areas making foraging easier for this sight feeder. Increased invertebrate production may have also made more apple snails (*Pomacea paludosa*) available.

Unaltered bulrush and cattail margins adjacent to muck removal sites were the preferred nesting habitat. Clumps of woody stem plants, such as willow trees (*Salex caroliniana*), left unaltered in muck removal areas, were not utilized for anything other than perching.

ALLIGATOR CHAIN

Fish Populations

Electrofishing

Sampling conducted on Coon Lake from 1992 to 1995 indicated poor populations of sport fish and forage species. Bluegill (primarily subharvestable) and Florida gar dominated numerical abundance (Table 23). Bluegill and Florida gar were also the dominant species during the 1984 to 1985 study. The CPUE for largemouth bass averaged 8 fish/h from 1992-95; only three harvestable bass were sampled. This compares to 10 harvestable largemouth bass sampled during 1984-85. Although forage CPUE's increased throughout the study and were higher than 1984-85 estimates, indices were still low. Low primary productivity, a poor forage base, and degraded habitat likely contributed to low numbers of harvestable sport fish sampled.

Total CPUE estimates on Lake Center increased 93% from 1994 to 1995 (Table 24). The increase was primarily attributed to increases in bluegill, redear sunfish and largemouth bass numbers. Approximately 70% of bluegill sampled were $\leq$ 80 mm, which was comparable to 1984-85. Even though largemouth bass numbers increased, only three were harvestable-size during 1995. Forage fish species were sampled at very low rates, indicating poor populations.

Habitat Improvement

Aquatic plant harvesters removed 19.7 ha of floating tussocks on lakes Coon (1992: 3.2 ha), Center (1992-93: 9.4 ha), Lizzie (1995: 3.7 ha) and Trout (1995: 3.4 ha). Tussocks were composed of bands of pickerelweed, burhead sedge, primrose willow *(Ludwgia spp.)*, elephant ear *(Colocasia esculenta)* and American cupscale grass *(Sacciolepis striata)*. Total cost for the entire project was $333,676. Funding was provided by the FGFWFC and the SFWMD.

Costs varied greatly due to density and type of vegetation, as well as travel distance from work-site to off-loading site. The dense vegetation band on Coon Lake was predominately pickerelweed, which contained tightly intertwined roots and organic. The travel distance was >400 m; cost was $29,180/ha. Tussocks made up of American cupscale grass, burhead bulrush, elephant ear and primrose willow (Lake Center) were easily pulled apart by harvesters. Cost on Lake Center was $17,533/ha even though hauling distances ranged from 400 m to 1200 m. When travel distances were $\leq$ 200 m, cost decreased substantially, as was the case on lakes Lizzie and Trout ($11,091/ha). Tussock material was placed on SFWMD canal banks, property owned by Osceola County and private property.

Over 40 homeowners contracted Adirondack Harvesters Inc. to remove vegetation in front of their property from 1992 to 1995. In addition, the Alligator Lake Chain Homeowners Association organized a harvesting project in 1996 in which 55 homeowners participated. Total area enhanced by private homeowners was estimated at 1 ha.

Native aquatic plants (maidencane, knotgrass and giant bulrush) recolonized the harvested areas, creating more desirable aquatic habitat for the fishery. Two thousand giant bulrush plants were planted by FGFWFC biologists and SFWMD personnel on the enhanced sites of lakes Coon and Center. Bulrush planted in water depths exceeding 1.2 m did not survive.

Depths of organic sediments were recorded immediately after tussock removal on lakes Coon and Center. Sediments ranged from 14 to 25 cm deep. Six months later, sediment depths (0 to 14 cm) decreased as wave action moved sediments to the outer edge of the sites. Observations through June 1996 revealed hard sand bottom and sparse vegetation.

prevent collapse. Following the project, Snail Kites showed a preference for enhanced areas which was likely the result of improved feeding areas and increased forage base.

ALLIGATOR CHAIN

The tussock removal project provided beneficial spawning and rearing habitat. Fish numbers on Lakes Coon and Center did not respond as positively to the improved habitat as biologists would have liked. An extreme drawdown will help increase these populations, but to put these lakes in the same category as lakes Kissimmee and Tohopekaliga is unrealistic due to low primary productivity and associated poor forage.

RECOMMENDATIONS

EAST LAKE TOHOPEKALIGA

1. Continue monitoring water quality on East Lake Tohopekaliga and its associated watershed.
2. Conduct a 1997 age/growth study and creel survey to determine whether the 1991 largemouth bass year class recruited to harvestable size.
3. Continue to monitor fish populations on an annual basis and vegetation communities on an alternate year basis to determine longevity of 1990 muck removal areas as sportfish habitat.

ALLIGATOR CHAIN OF LAKES

1. Plan a habitat enhancement project for the Alligator Chain of Lakes, which will include: drawdown, muck removal, burning and aquatic plant management.

LITERATURE CITED

Bachmann, R.W. and D.E. Canfield Jr. 1993. The Alligator Lakes Chain: A water quality monitoring report. Florida Lakewatch Program. Department of Fisheries and Aquatic Sciences. University of Florida, Gainesville.

Butler, Robert S., E.J. Moyer, V.P. Williams, M.W. Hulon. 1992. Littoral zone invertebrate communities as affected by a habitat restoration project on Lake Tohopekaliga, Florida. Journal of Freshwater Ecology 7:317-328.

Coleman, W.S., S.M. Crawford and W.P. Porak. 1984. Final Report for Largemouth Bass Investigations Project. D-J Federal Aid Project F-24, Study XI. Florida Game and Fresh Water Fish Commission, Tallahassee, Florida.

Dressler, R.L., D.W. Hall, K.D. Perkins and N.H. Williams. 1987. Indentification Manual for Wetland Plant Species of Florida. Institute of Food and Agricultural Sciences. Univ. Of Florida, Gainesville.

Hulon, M.W., E.J. Moyer, R.W. Hujik, R.S. Butler, S.B. Cook. 1992. Largemouth bass creel results for tournament and non-tournament Anglers, Lake Kissimmee, Florida. Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl.Agencies 46:307-313.

Moyer, E.J., M.W. Hulon, G.L. Zuhl. 1985a. East Lake Tohopekaliga Completion Report, Study No. I, 1983-85. Florida Game and Fresh Water Fish Commission. Tallahassee, Florida.

Moyer, E.J., M.W. Hulon, G.L. Zuhl. 1985b. Alligator Chain Completion Report, Study No. II, 1983-85. Florida Game and Fresh Water Fish Commission. Tallahassee, Florida.

Moyer, E.J., M.W. Hulon, R.S. Butler. 1987. Lake Tohopekaliga Completion Report, 1983-87. Florida Game and Fresh Water Fish Commission. Tallahassee, Florida.

Moyer, E.J., M.W. Hulon, R.S. Butler, R.W. Hujik and J. Buntz. 1991. East Lake Tohopekaliga Completion Report, 1986-91. Florida Game and Freshwater Fish Commission, Tallahassee, Florida.

Moyer, E.J., M.W. Hulon, J. Buntz, R.W. Hujik, J.J. Sweatman, C.S. Michael. 1992. Lake Tohopekaliga Completion Report, 1987-1992. Florida Game and Freshwater Fish Commission, Tallahassee, Florida.

Moyer, E.J., M.W. Hulon, J. Buntz, R.W. Hujik, J.J. Sweatman, C.S. Michael. 1993. Lake Kissimmee Completion Report, 1988-1993. Florida Game and Freshwater Fish Commission, Tallahassee, Florida.

Moyer, E.J., M.W. Hulon, J.J. Sweatman, R.S. Butler, V.P. Williams. 1995. Fishery responses habitat restoration in Lake Tohopekaliga, Florida. NJFM 15:591-595.

South Florida Water Management District. 1981. Report to the Governing Board on Regulatory Levels for The Lakes of the Upper Kissimmee Basin.

Tarver, D.P., J.A. Rodgers, M.J. Mahler and R.L. Lazor. 1979. Aquatic and Wetland Plants of Florida, 2nd Edition. Florida Department of Natural Resources, Tallahassee, Florida.

Wegener, W.L. 1969. East Lake Tohopekaliga Fishery Investigations. Florida Game and Fresh Water Fish Commission, Tallahassee, Florida.

Wegener, W.L., D.E. Holcomb and V.P. Williams. 1973. Sampling Shallow Water Fish Populations using the Wegener Ring. Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Agencies. 27:633-673.

Wegener, W.L., V.P. Williams, and T.D. McCall. 1974. Aquatic macroinvertebrate responses to an extreme drawdown. Proc. 28th Ann. Conf. Southeast. Assoc. Game Fish Comm., 126-144.

Williams, V.P., E.J. Moyer, M.W. Hulon. 1979. Completion Report for Lower Kissimmee Basin. Florida Game and Freshwater Fish Commission, Tallahassee, Florida.

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REVIEWED BY:

MIKE HULON	Nov 27, 1996
SNYDER/SWEATMAN	12/13/96
ANNA-TYPING	12/17/96
SWEATMAN	12/19/96
ANNA-TYPING	12/26/96
SWEATMAN	January 6, 1997

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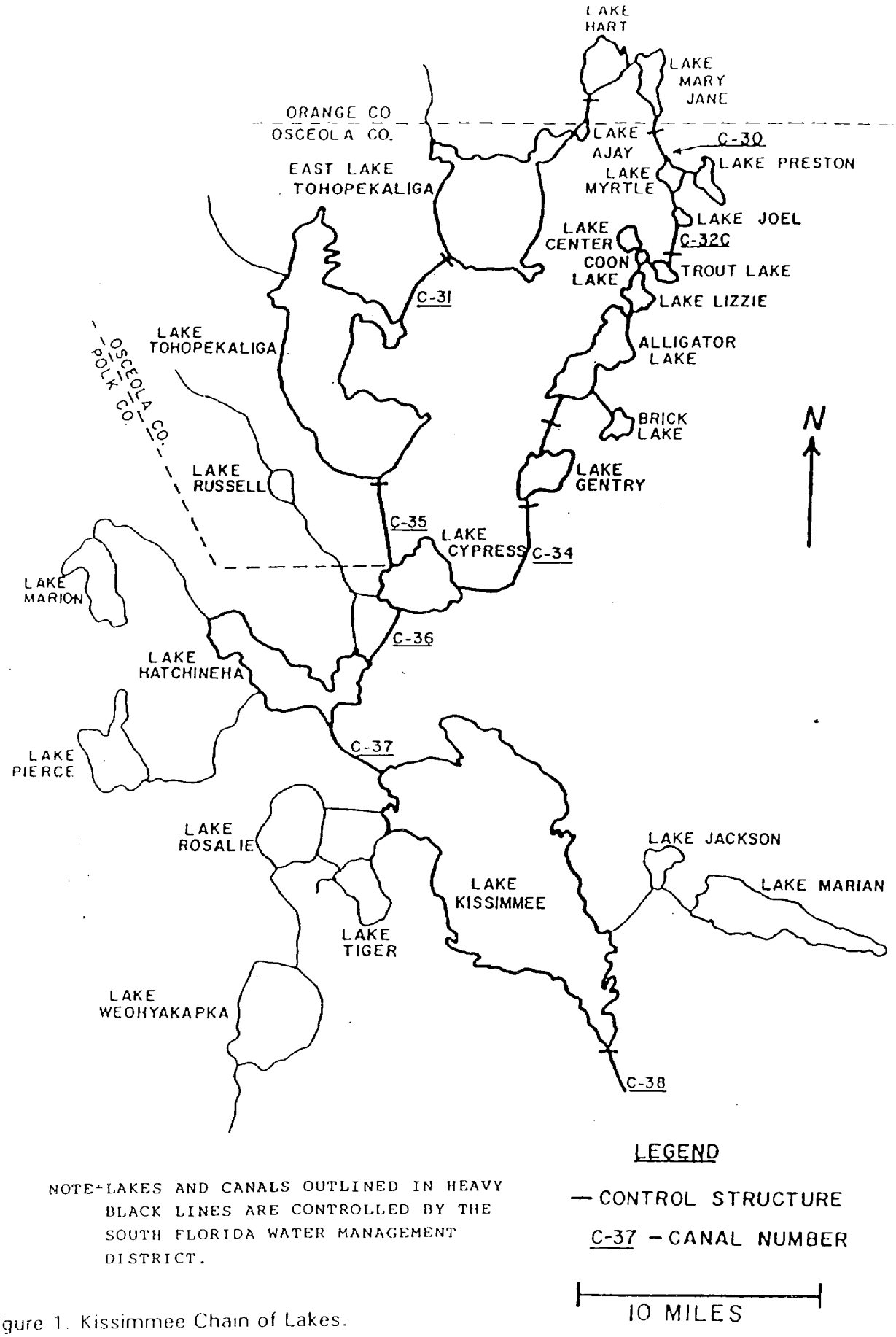

Figure 1. Kissimmee Chain of Lakes.

TABLE 2. A comparison of catch per unit effort of harvestable sportfish sampled in ten different lakes by electrofishing during spring 1983 through 1985.

LAKE	Largemouth bass (≥ 25 cm) No./hr.			Bluegill (≥ 15 cm) No./hr.			Redear sunfish (≥ 15 cm) No./hr.		
	1983	1984	1985	1983	1984	1985	1983	1984	1985
Alligator	28.6	58.0	65.3	14.9	30.0	40.0	22.3	31.5	29.3
East Tohopekaliga	41.8	57.4	95.6	6.5	7.7	18.7	19.7	16.7	27.6
Gentry	21.2	46.6	54.7	9.4	25.4	13.3	2.6	22.7	21.3
Brick		14.3	22.7		66.8	134.7		1.3	1.3
Center		13.3	9.3		20.0	10.7		1.3	1.3
Coon		23.8	12.0		11.9	16.0		8.0	2.7
Lizzie		17.3	37.3		14.5	13.3		26.6	17.2
Trout		10.5	9.3		3.9	6.7		0	32.0
Hart		14.4	17.3		18.6	1.3		3.9	13.3
Mary Jane		12.0	10.7		7.0	5.5		4.0	4.0

TABLE 3. Expanded numbers and pounds per acre for species collected in shallow water fish population sampling for Lake Gentry in spring 1983 through 1985.

YEAR	Number/acre			Pounds/acre		
	1983	1984	1985	1983	1984	1985

To L.A.
10/8/99

Kissimmee Chain of Lakes Studies
1998-99 Annual Report
Study 6301- Job 3
Alligator Chain of Lakes/Lake Gentry Investigations

Management activities

The Alligator Lake Chain and Lake Gentry Habitat Enhancement Project is proceeding forward even though some revisions to the original plan have been proposed. A Draft Environmental Impact Statement (DEIS) covering effects of the proposed enhancement project was received by project staff in early April 1999 from the United States Army Corps of Engineers (USACE). Comments regarding aspects of the DEIS were returned to USACE by June 1999. A final Environmental Impact Statement is scheduled to be released for public comment by mid-August with recommendations on how to proceed. The USACE will make their final decision for the project by November 1999. Project staff are optimistic the enhancement project will be approved and implemented.

As a result of natural drought conditions during late spring/early summer 1999, staff biologists were afforded an opportunity to initiate a small-scale muck removal operation in isolated areas of lakes Alligator, Coon and Center. Removal of exposed organic sediments from these lakes commenced 27 May 1999 and was completed 25 June 1999. Approximately 63,615 m^3 (83,200 yd^3) of material were removed from the south and east shores of Alligator Lake and placed on designated upland disposal sites (Figure 1). An additional 65,756 m^3 (86,000 yd^3) of organic material were removed from lakes Coon (south and west shore) and Center (north shore) with most of the material utilized to create permitted, in-lake disposal islands and remaining sediments deposited at permitted, upland disposal sites (Figure 2). Commitment by the Florida Fish and Wildlife Conservation Commission and South Florida Water Management District will

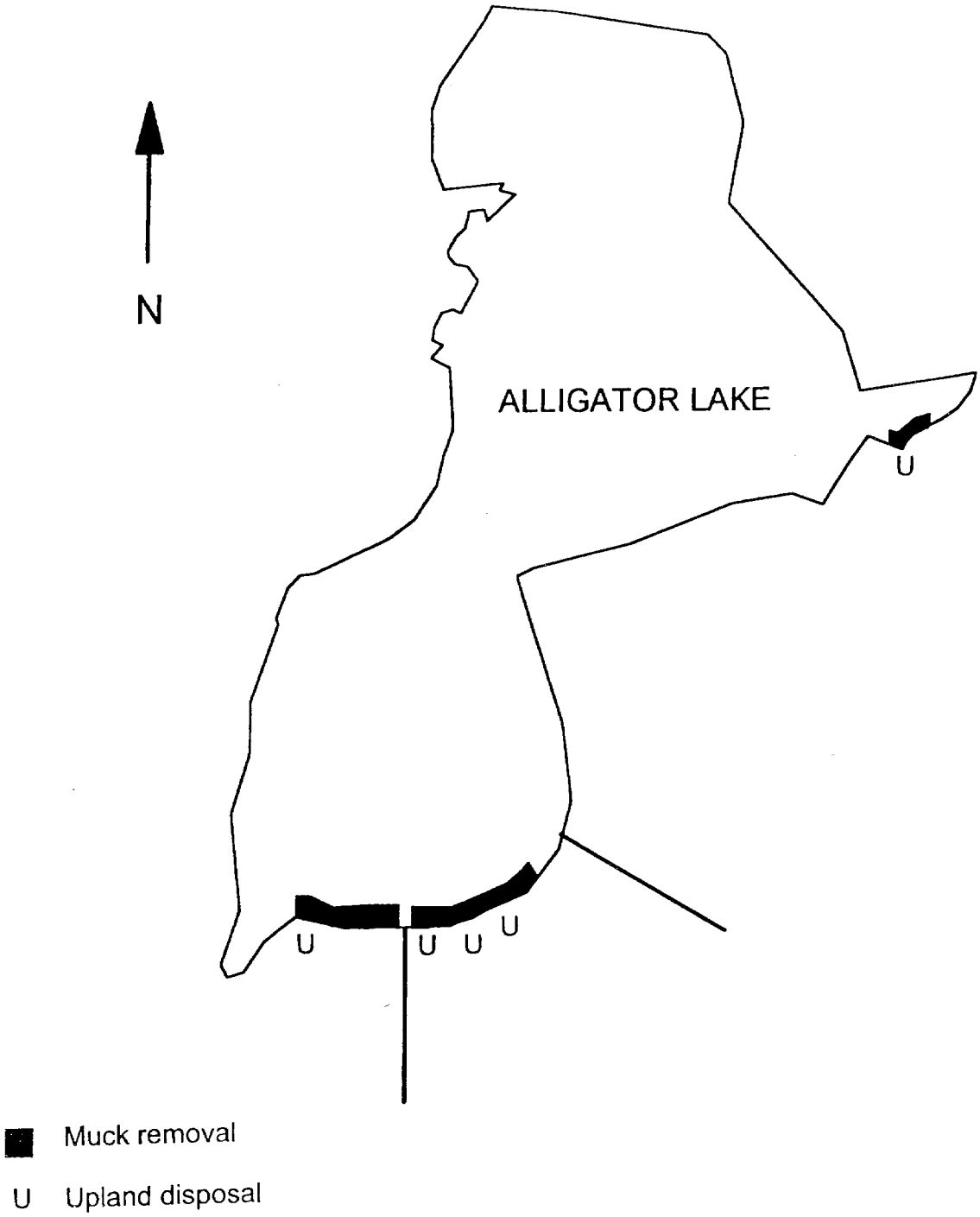

Figure 1. Map of enhancement activities (muck removal) conducted on Alligator Lake from May through June 1999.

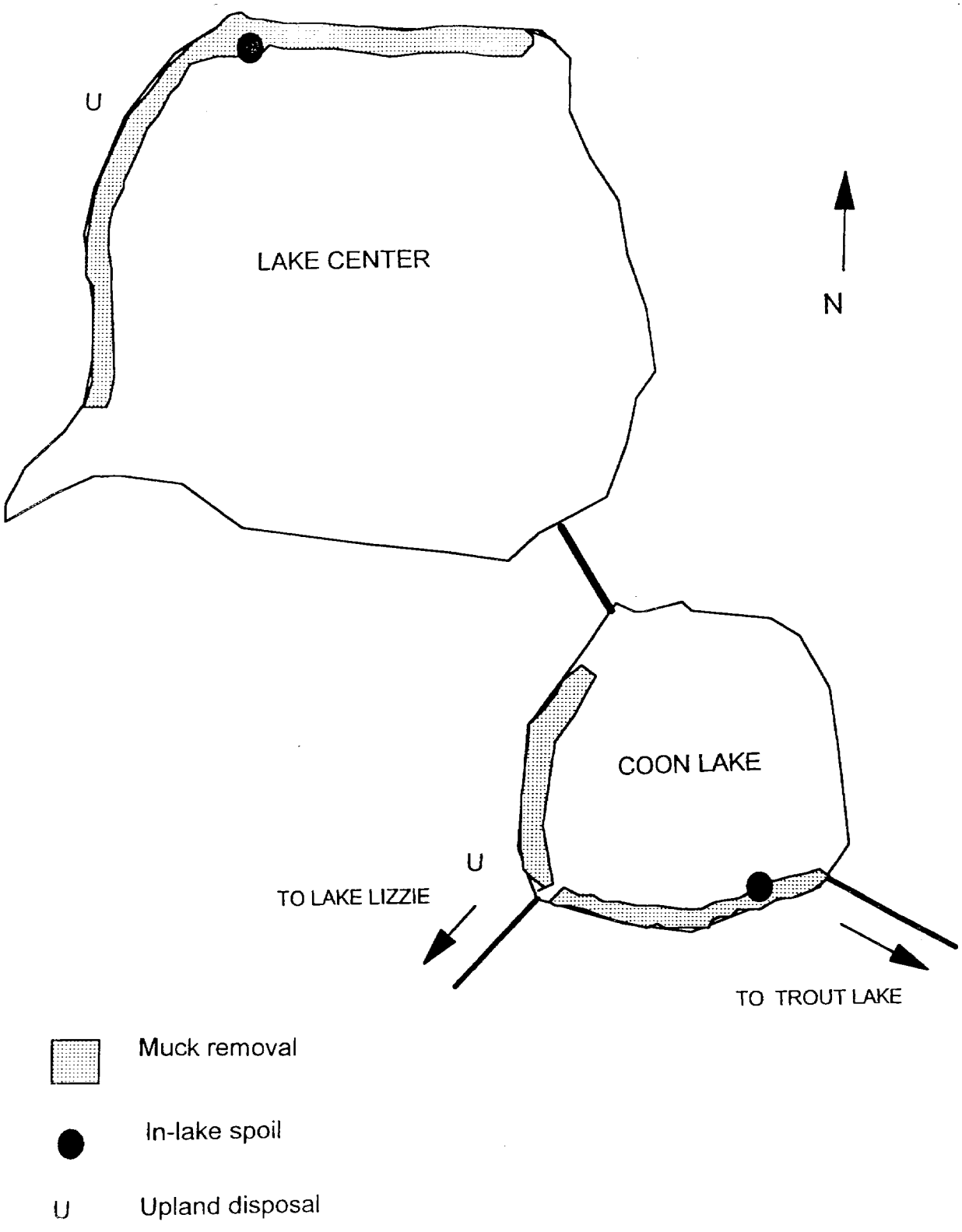

Figure 2. Map of enhancement activities (muck removal) conducted on lakes Coon and Center from May through June 1999.

continue in an effort to reverse detrimental effects of water stabilization on fish and wildlife habitat within this chain of lakes.

Evaluation

In spring 1999, electrofishing catch rates increased for each of the Alligator Chain of Lakes sampled. The 1999 mean catch-per-unit-effort (CPUE) values for largemouth bass (*Micropterus salmoides*) ranged from 20 fish/h to 91 fish/h (Table 1). Of the five size groups recorded, bass values in the 201 mm to 355 mm total length (TL) range were predominant at all lakes sampled (Table 2). Bluegill (*Lepomis macrochirus*) CPUE values were impressive for lakes Alligator and Center at 111 fish/h and 131 fish/h, respectively. Bluegill <152 mm were well represented at all lakes sampled, but harvestable fish (>152 mm) were few. Redear sunfish (*Lepomis microlophus*) values varied from 36 fish/h at Alligator Lake to 0 fish/h at Lake Gentry. Harvestable redear (>152 mm) were found in equal or greater number than redear <152 mm at lakes Lizzie, Center, Trout and Alligator Lake. Although increases in CPUE were documented, low water levels, as a result of drought conditions during spring 1999, and/or fish spawning activity may have influenced catch rates.

In order to document pre-enhancement utilization of the Alligator Chain of Lakes by aquatic-oriented bird species, whole-lake bird counts (one survey/month) were initiated in April 1999. Compared to other lakes within the chain, Alligator Lake was shown to have higher species diversity and numbers, on average, during months surveys were conducted (April - June; Table 3).

Effects of drought conditions during spring 1999 on water quality were reflected primarily by increased mineral concentrations within both Alligator Lake and Lake Gentry.

Table 1. Mean electrofishing catch-per-unit-effort (fish/h) values for fish species collected from littoral transects in lakes Alligator, Gentry, Lizzie, Center, Coon and Trout during spring 1999.

Lake	Alligator			Gentry			Lizzie		
Year	1997	1998	1999	1997	1998	1999	1997	1998	1999
Species									
Largemouth bass	33	29	71	28	24	20	27	7	52
Black crappie	4	1	1	4	0	1	3	1	7
Bluegill	39	39	111	27	89	84	19	32	48
Redear sunfish	7	15	36	8	17	0	4	5	28
Longnose gar	1	1	1	1	1	0	0	0	0
Florida gar	19	9	20	19	5	17	49	15	47
Bowfin	6	1	5	3	3	4	5	4	1
Gizzard shad	1	1	0	0	0	0	0	0	0
Threadfin shad	0	3	0	0	0	0	0	0	0
Golden shiner	2	2	5	1	1	5	7	3	4
Taillight shiner	0	0	3	0	0	0	0	0	0
Lake chubsucker	11	10	17	19	7	20	9	3	7
Yellow bullhead	2	1	0	0	0	0	1	0	0
Brown bullhead	1	0	1	0	0	0	3	1	0
Channel catfish	5	1	2	3	0	0	0	0	0
Redfin pickerel	0	0	1	0	0	0	0	0	0
Chain pickerel	5	1	4	4	4	4	12	1	4
Atlantic needlefish	1	1	1	0	0	0	1	0	0
Golden topminnow	0	5	0	0	0	0	0	0	0
Seminole killifish	1	7	11	0	9	1	0	0	0
Brook silverside	6	1	6	5	1	3	1	0	3
Warmouth	3	1	18	4	5	7	5	11	15
Dollar sunfish	1	0	1	4	0	5	0	4	0
Spotted sunfish	0	0	0	0	4	0	0	0	0
TOTAL	148	129	315	130	170	171	146	87	216